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State of Alaska & Aleutian/Pribilof Islands Association

White Paper [1]

Radiological Assessment and Long-Term Stewardship Amchitka Island, Alaska, Underground Nuclear Test Area

June 2001

I. Introduction

At the Amchitka Island underground nuclear test area (UGTA) the United States Atomic Energy Agency (AEC), now the Department of Energy (DOE) conducted Project Cannikin, its largest underground nuclear test, with a yield of about 5 megatons. Preceding that test were Projects Long Shot and Milrow, tests of approximately 80 kilotons and 1 megaton. Because of these three tests, an estimated 15-16% of the total effective yield of all the U.S. underground nuclear tests were expended at the Amchitka UGTA.

Amchitka Island, Alaska is unique among all of the DOE former nuclear test sites in the continental United States because of the uncontrolled pathways that can transport radionuclides from the underground tests to the marine environment. This area is also in one of most seismically active regions in the world and the Aleutian archipelago also has numerous volcanoes. The marine environment around Amchitka hosts one of the richest commercial fisheries in the world and is an important subsistence harvest area for Alaska Natives.

Modeling done for the US Atomic Energy Commission in 1964 reported that credible gross travel times for release of radionuclides from the Long Shot test would be on the order of 10 to 1000 + years to the marine environment. Numerous groundwater modeling exercises since then, up to the most recent, continue to estimate leakage occurring from the Amchitka UGTA to the marine environment within a period of 10 to 1000+ years.

DOE has not monitored the marine environment around Amchitka for over 22 years and, thus, we have no data to assess the current situation. Models based on limited data and lacking current information from the site are no substitute for collecting actual field data. The State of Alaska and the Aleutian/Pribilof Islands Association, Inc. (A/PIA) have no confidence in this work unless it is done properly and is scientifically defensible. It is important to use current data and knowledge in making this assessment and not just historical data or modeling.

Based on the historic modeling, general knowledge of island hydrology and radionuclide transport mechanisms the question is not "if" leakage will occur to the marine environment, but when, where, and how much.

The specter of radionuclides leaking from the island, even at very low levels, is a real concern for subsistence users. Aleuts and other Alaska natives are encouraged to utilize subsistence foods for its importance to their cultural beliefs and health. Abandonment of the

[1] A technical Appendix to this White Paper is available upon request from Alaska Department of Environmental Conservation

region's subsistence foods based on unfounded fears of radionuclide contamination would result in significant cultural erosion and negative health impacts.

Commercial fisheries could suffer if we do not understand what is occurring around Amchitka and wait for other organizations to tell us what is happening. Understanding the environmental conditions around Amchitka that will affect radionuclide fate and transport will provide for a sound-monitoring program to verify radionuclide concentrations currently and over time. It is important to continue to verify the pristine nature of the commercial fisheries and subsistence foods in this region. Only by conducting a stakeholder based independent, scientifically sound, assessment can we assure the public that commercial seafood products and subsistence foods remain pristine and of the highest quality in regards to the radiological situation.

Due to this lack of current data and studies the State of Alaska and the A/PIA, cannot provide the public with any current scientific evidence to:

- Assess if Amchitka Island UGTA is or is not leaking radionuclides to the marine environment.
- Assess the current radionuclide levels in the environment around Amchitka Island, Alaska.
- Develop current accurate scientific data to assess the hazards to human or ecological health in the environment surrounding Amchitka.

Based on data from other studies in the South Pacific, the Arctic Ocean, and in the Beaufort Sea, it is believed that little radiological hazard exists. While we believe this, no current scientific data based on fieldwork exists for the marine environment around Amchitka to support our statement.

DOE has suggested that biological sampling results for radionuclides from Barrow, Alaska might be adequate to address Aleut Natives concerns.[2] This would be akin to telling someone in New Jersey near a contaminated site that their local foods are safe to eat because the government sampled foods in Wyoming. This is not acceptable as it will only create more distrust and continue to generate fears regarding the situation at Amchitka and in the marine environment.

II. Scientific Environmental Assessment Needs Considered of High Priority by the State of Alaska

❖ Ecological and Human Risk Assessment

- ➢ Establish a subsistence food sampling and analysis program.
- ➢ Utilize sensitive and US Fish & Wildlife trust species to monitor the current and future radionuclide contamination in marine species.
- ➢ Scientifically assess current and long-term human risk, especially to subsistence users.

❖ Modeling the Fate and Transport of Radionuclides from Groundwater to the Marine Environment

- ➢ Scientifically credible modeling of the fate and transport of radionuclides from the groundwater to marine environment is the primary tool by which to evaluate the

[2] See DOE letter of July 1997 from Mr. Ralph C. Lightner to Mr. Doug Dasher of ADEC

radionuclide threat to the marine environment and the associated human health risk to subsistence and commercial users of the marine environment.

- Modify the current conceptual models and any future models to incorporate the Amchitka site geological structure and account for the multi-layered aquifer properties.
- Additional verification is necessary to establish sorption coefficients, and other properties to support use in the model for aquifer layers. This must be accomplished by lab studies using Amchitka drilling core. The protocol used for the Yucca Mountain project sorption studies can be applied to the Amchitka work.
- An aquifer recharge study is necessary.
- Geophysical studies need to be done to assess post shot fracturing and evaluate fault characteristics.
- Install a minimum of three monitoring wells to evaluate the island hydrogeological properties and address unresolved issue of salt/fresh water diffusion zone.
- Install additional monitoring wells based on the modeling efforts for post-audit validation and long term monitoring.

❖ **Radiological Assessment of the current situation in the terrestrial and marine environment**

- An Environmental Assessment of existing marine conditions should include:
  - Bathymetry of the seafloor adjacent the underground nuclear test sites.
  - Survey to locate freshwater seepage sites.
  - Estimate the seepage rates.
  - Conduct a seabed floor gamma survey.
  - Abiotic and biotic sampling to determine current radioactive levels, biological concentration factors, and for assessment of ecological effects.
  - Collect physical oceanography data necessary to calibrate/validate a marine radionuclide fate and transport model.
  - Develop a marine radionuclide fate and transport model.

- Terrestrial Environment
  - Independent review of the terrestrial radiological data collected to date and specific assessment of the Long Shot site near surface leakage event and recommendations on closure actions.
  - Design and implementation of a closure plan for Long Shot.

III. Long Term Stewardship

Successful long-term stewardship of the potential environmental hazards for the Amchitka area depends upon a partnership mentored by the State of Alaska and A/PIA with Aleut tribal, community leaders, other stakeholders and federal agencies. The stewardship task will be to integrate the results and interpretation of the radiological assessment activities discussed in this document with all parties into a scientifically sound community focused long term monitoring program.

IV. Alaska Regulatory Requirements

In Alaska's 18 AAC 75, OIL AND OTHER HAZARDOUS SUBSTANCES POLLUTION CONTROL regulations there are numerous requirements that should be met for in-situ hazardous substances. The meeting of these regulatory requirements is a necessary part of

reaching any site "closure" of environmental restoration activities and acceptance of a long-term stewardship program.

These include but are not limited to:
(A) a site monitoring plan showing proposed locations of monitoring wells;
(B) a hydrogeologic description of the site, including
    (i) soil and sediments present;
    (ii) stratigraphy;
    (iii) aquifer characteristics, including groundwater gradient, confining layers, perched water, permeability, and aquifer transmissivity;
    (iv) percolation rates from precipitation; and
    (v) other relevant factors;
(C) results of hydrogeologic modeling performed to address capture zones, effects of hydraulic loading, and plume migration; and other items.

Groundwater modeling preformed must also be validated with test wells confirming that the model has valid predictive performance. Marine modeling must also be validated.

V. Potential Alternative Scientific Studies

The State of Alaska remains willing to discuss with DOE the potential for an alternative to some of the ADEC regulatory requirements in 18 AAC 75. Any alternative would have to meet the State of Alaska and A/PIA's request for the conduct of an independent scientific radiological assessment.

Such an alternative will require an agreement between A/PIA, DOE, State of Alaska, US Environmental Protection Agency, and US Fish and Wildlife on the assessment program. In addition, it would include specific end points, standards, and timelines. As the radiological contamination according to DOE cannot be cleaned up nor kept from leaking into the marine environment the term closure, typically indicative of some form of cleanup or containment is not relevant to this site. The State of Alaska considers closure to be achieved in this unique circumstance when an agreed upon independent radiological assessment has been conducted and a long-term stewardship plan, agreed upon by the entities listed above, is in place and implemented. Provided the agreed upon independent assessment is done and no radiological hazards are found, DOE would be assured of receiving closure as defined above.

The State of Alaska, A/PIA and the University of Alaska have developed a suggested scientific study alternative that would meet many of our concerns and likely avoid well drilling. A consortium consisting of the State of Alaska, A/PIA, and the University of Alaska, with outside technical institutional support as required, would conduct the studies. Under this lead group, different technical task groups would exist to address the current and future situations. Other agencies and stakeholders would be represented. DOE would provide technical and, if required, management staff, but only in a liaison or *ex offico* capacity. It is estimated that this study would take four to five years and cost ten to twelve million dollars. This can be contrasted to the well drilling costs for nine wells at Amchitka that would conceivable run over thirty-five million

dollars based on rough estimates from recent costs to drill monitoring wells at the Nevada Test Site.

VI. Fundamental Environmental Protection Objectives

1) Assess the current existing radiological situation in Amchitka's terrestrial environment and in the near and far-field marine environment around the island.
2) Determine if any current radiological hazards exist either to humans or other ecological receptors in the involved areas. One primary focus will be Aleut Native subsistence food gatherers and commercial fisheries enterprises.
3) Evaluate the potential long-term radiological situation in Amchitka's terrestrial environment and in the near and far-field marine environment around the island.
4) Evaluate potential impacts from our current understanding developed in (3) to human and other ecological receptors.
5) Based on the above and input from stakeholders develop a long-term stewardship monitoring program that is scientifically sound and meets stakeholders needs.